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PATENT

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October 24, 2006

Date

Jason Añover

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : David A. Tirrell et al.
Application No. : 10/612,713
Filed : July 1, 2003
For : OVEREXPRESSION OF AMINOACYL-tRNA SYNTHETASES
FOR EFFICIENT PRODUCTION OF ENGINEERED PROTEINS
CONTAINING AMINO ACID ANALOGUES

Examiner : David Guzo
Art Unit : 1636
Docket No. : 110197.402C1
Date : October 24, 2006

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

Commissioner for Patents:

In accordance with 37 CFR 1.56 and 1.97 through 1.98, applicants wish to make known to the U.S. Patent and Trademark Office the references set forth on the attached Information Disclosure Statement. Copies of cited U.S. patents and published patent applications are not required and accordingly have not been provided. Copies of any other cited references are enclosed. As to any reference cited, applicants do not admit that it is "prior art" under 35 U.S.C. §§ 102 or 103, and specifically reserve the right to traverse or antedate any such

reference, as by a showing under 37 CFR 1.131 or other method. Although the aforesaid references are made known to the Patent and Trademark Office in compliance with applicants' duty to disclose all information they are aware of which is believed relevant to the examination of the above-identified application, applicants believe that their invention is patentable.

Please acknowledge receipt of this Information Disclosure Statement and kindly make the cited references of record in the above-identified application.

A fee of \$180 is submitted in accordance with 37 CFR 1.97(c). The Director is authorized to charge any other fees which may be required, or credit any overpayment to Deposit Account No. 19-1090.

Respectfully submitted,
Seed Intellectual Property Law Group PLLC

A handwritten signature in black ink, appearing to read 'W. T. Christiansen', is written over a horizontal line.

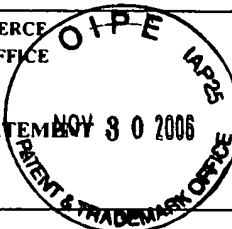
William T. Christiansen, Ph.D.
Registration No. 44,614

Enclosures:

Check
Information Disclosure Statement
Cited References (86)

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U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICESUPPLEMENTAL
INFORMATION DISCLOSURE STATEMENT
(Use several sheets if necessary)

ATTY. DOCKET NO.

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APPLICATION NO.

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U.S. PATENT DOCUMENTS

*EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
AA	5,370,995	12/06/94	Hennecke et al.	435	69.1	

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DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES NO
AB			

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

AC	Bain, J., et al., "Biosynthetic Site-specific Incorporation of a Non-natural Amino Acid into a Polypeptide," <i>J. Am. Chem. Soc.</i> , 111:8013-8014, 1989.
AD	Barton, D., et al., "Synthesis of Novel α -Amino-Acids and Derivatives Using Radical Chemistry: Synthesis of L- and D- α -Amino-Adipic Acids, L- α -aminopimelic Acid and Appropriate Unsaturated Derivatives," <i>Tetrahedron</i> , 43:4297-4308, 1987.
AE	Bradley, D., et al., tRNA ^{Gln} Su ⁺ 2 Mutants that Increase Amber Suppression," <i>J Bacteriol.</i> , 145(2):704-12, February 1981.
AF	Brick, P., et al., "Structure of Tyrosyl-tRNA Synthetase Refined at 2.3 Å Resolution. Interaction of the Enzyme with the Tyrosyl Adenylate Intermediate," <i>J. Mol. Biol.</i> , 208(1):83-98, 1989.
AG	Budisa, N., et al., "Bioincorporation of Telluromethionine into Proteins: a Promising New Approach for X-ray Structure Analysis of Proteins," <i>J Mol Biol.</i> , 270(4):616-23, July 25, 1997.
AH	Budisa, N., et al., "High-level Biosynthetic Substitution of Methionine in Proteins by its Analogs 2-aminohexanoic Acid, Selenomethionine, Telluromethionine and Ethionine in <i>Escherichia coli</i> ," <i>Eur. J. Biochem</i> , 230(2):788-796, 1995.
AI	Budisa, N., et al., "Residue-specific Bioincorporation of Non-natural, Biologically Active Amino Acids into Proteins as Possible Drug Carriers: Structure and Stability of the Per-thiaproline Mutant of Annexin V," <i>Proc Natl Acad Sci U S A</i> , 95(2):455-9, January 20, 1998.
AJ	Budisa, N., et al., "Toward the Experimental Codon Reassignment in Vivo: Protein Building with an Expanded Amino Acid Repertoire," <i>FASEB J.</i> , 13(1):41-51, January 1999.
AK	Christie, B., et al., "Synthesis of Optically Pure Pipecolates from L-Asparagine. Application to the Total Synthesis of (+)-Apovincamine through Amino Acid Decarboxylation and Iminium Ion Cyclization," <i>J. Org. Chem.</i> , 50:1239-1246, 1985.

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	BA						
FOREIGN PATENT DOCUMENTS							
		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION		
					YES	NO	
	BB						
OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)							
	BC	Cornish, V., et al., "Site-specific Protein Modification Using a Ketone Handle," <i>J. Am. Chem. Soc.</i> , 118:8150-8151, 1996.					
	BD	Doctor, B., et al., "Species Specificity Of Amino Acid Acceptor Ribonucleic Acid And Aminoacyl Soluble Ribonucleic Acid Synthetases," <i>J Biol Chem.</i> , 238:3677-81, November 1963.					
	BE	Döring, V., et al., "Enlarging the Amino Acid set of Escherichia coli by Infiltration of the Valine Coding Pathway," <i>Science</i> , 292(5516):501-4, April 20, 2001.					
	BF	Dougherty, D., "Unnatural Amino Acids as Probes of Protein Structure and Function," <i>Curr Opin Chem Biol.</i> , 4(6):645-52, December 2000.					
	BG	Ellman, J., et al., "Biosynthetic Method for Introducing Unnatural Amino Acids Site-Specifically Into Proteins," <i>Methods Enzymol.</i> , 202:301-36, 1991.					
	BH	Ellman, J., et al., "Site-specific Incorporation of Novel Backbone Structures into Proteins," <i>Science</i> , 255(5041):197-200, January 10, 1992.					
	BI	England, P., et al., "Backbone Mutations in Transmembrane Domains of a Ligand-gated Ion Channel: Implications for the Mechanism of Gating," <i>Cell</i> , 96(1):89-98, January 8, 1999.					
	BJ	Fechter, P., et al., "Major Tyrosine Identity Determinants in Methanococcus Jannaschii and Saccharomyces cerevisiae tRNA(Tyr) are Conserved but Expressed Differently," <i>Eur J Biochem.</i> , 268(3):761-7, February 2001.					
	BK	Francisco, J., et al., "Production and Fluorescence-activated Cell Sorting of Escherichia coli Expressing a Functional Antibody Fragment on the External Surface," <i>Proc Natl Acad Sci U S A.</i> , 90(22):10444-8, November 15, 1993.					
	BL	Friedman, O., et al., "Synthesis of Derivatives of Glutamine as Model Substrates for Anti-Tumor Agents," <i>J. Am. Chem. Soc.</i> , 81:3750-3752, 1959.					
	BM	Furter, R., "Expansion of the Genetic Code: Site-directed p-fluoro-phenylalanine Incorporation in Escherichia coli," <i>Protein Sci.</i> , 7(2):419-26, February 1998.					
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CA						

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				YES	NO
CB					

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

CC	Gabriel, K., et al., "A Set of Plasmids Constitutively Producing Different RNA Levels in Escherichia coli," <i>J Mol Biol.</i> , 290(2):385-9, July 9, 1999.
CD	Gallivan, J., et al., "Site-specific Incorporation of Biotinylated Amino Acids to Identify Surface-exposed Residues in Integral Membrane Proteins," <i>Chem Biol.</i> , 4(10):739-49, October 1997.
CE	Gay, G., et al., "Modification of the Amino Acid Specificity of Tyrosyl-tRNA Synthetase by Protein Engineering," <i>FEBS Letters</i> , 318:167-171, 1993.
CF	Giegé, R., et al., "Aspartate Identity of Transfer RNAs," <i>Biochimie</i> 78(7):605-23, 1996.
CG	Giegé, R., et al., "Universal Rules and Idiosyncratic Features in tRNA Identity," <i>Nucleic Acids Res.</i> , 26(22):5017-35, November 15, 1998.
CH	Guckian, K., et al., "Highly Precise Shape Mimicry by a Difluoro-toluene Deoxynucleoside, a Replication-Competent Substitute for Thymidine," <i>Angew Chem. Int. Ed. Engl.</i> 36(24):2825-2828, 1997.
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CJ	Hartley, R., "Barnase and Barstar. Expression of its Cloned Inhibitor Permits Expression of a Cloned Ribonuclease," <i>J Mol Biol.</i> , 202(4):913-5, August 20, 1988.
CK	Hohsaka, T., et al., "Efficient Incorporation of Nonnatural Amino Acids with Large Aromatic Groups into Streptavidin in In Vitro Protein Synthesizing Systems," <i>J. Am. Chem. Soc.</i> , 121:34, 1999.
CL	Ibba, M., et al., "Relaxing the Substrate Specificity of an Aminoacyl-tRNA Synthetase Allows in vitro and in vivo Synthesis of Proteins Containing Unnatural Amino Acids," <i>FEBS Lett.</i> , 364(3):272-5, May 15, 1995.

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	DA						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION
					YES NO
	DB				

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	DC	Ibba, M., et al., "Substrate Specificity is Determined by Amino acid Binding Pocket Size in Escherichia coli Phenylalanyl-tRNA Synthetase," <i>Biochemistry</i> , 33(23):7107-12, June 14, 1994.
	DD	Ibba, M., "Strategies for in vitro and in vivo Translation with Non-natural Amino Acids," <i>Biotechnol Genet Eng Rev.</i> 13:197-216, December 1995.
	DE	Jakubowski, H., et al., "Editing of Errors in Selection of Amino Acids for Protein Synthesis," <i>Microbiol Rev.</i> , 56(3):412-29, September 1992.
	DF	Jeruzalmi, D., et al., "Structure of T7 RNA Polymerase Complexed to the Transcriptional Inhibitor T7 Lysozyme," <i>EMBO J.</i> , 17(14):4101-13, July 15, 1998.
	DG	Klick, K., et al., "Protein Engineering by In Vivo Incorporation of Non-Natural Amino Acids: Control Of Incorporation of Methionine Analogues by Methionyl-tRNA Synthetase," <i>Tetrahedron</i> , 56:9487-9493, 2000.
	DH	King, F., et al., "A New Synthesis of Glutamine and of γ -Dipeptides of Glutamic Acid from Phthalylated Intermediates," <i>J. Chem. Soc.</i> , 4:3315-3319, 1949.
	DI	Kleeman, T., et al., "Human Tyrosyl-tRNA Synthetase Shares Amino Acid Sequence Homology with a Putative Cytokine," <i>J Biol Chem.</i> , 272(22):14420-5, May 30, 1997.
	DJ	Kleina, L., et al., "Construction of Escherichia coli Amber Suppressor tRNA Genes. II. Synthesis of Additional tRNA Genes and Improvement of Suppressor Efficiency," <i>J Mol Biol.</i> , 213(4):705-17, June 20, 1990.
	DK	Kool, E., "Synthetically Modified DNAs as Substrates for Polymerases," <i>Curr Opin Chem Biol.</i> , 4(6):602-8, December 2000.
	DL	Koskinen, et al., "Synthesis of 4-Substituted Prolines as Conformationally Constrained Amino Acid Analogues," <i>J. Org. Chem.</i> 54:1859-1866, 1989.
	DM	Kowal, A., et al., "Exploiting Unassigned Codons in Micrococcus Luteus for tRNA-based Amino Acid Mutagenesis," <i>Nucleic Acids Res.</i> , 25(22):4685-9, November 15, 1997.

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EA						

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DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES NO
EB			

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

EC	Kowal, A., et al., "Twenty-first Aminoacyl-tRNA Synthetase-suppressor tRNA Pairs for Possible Use in Site-specific Incorporation of Amino Acid Analogues into Proteins in Eukaryotes and in Eubacteria," <i>Proc Natl Acad Sci U S A.</i> , 98(5):2268-73, February 27, 2001.
ED	Lee, J-Y., et al., "Novel Biological Process for L-DOPA Production from L-Tyrosine by <i>p</i> -hydroxyphenylacetate 3-hydroxylase," <i>Biotechnology letters</i> , 20(5):479-482, May 1998.
EE	Liu, D., et al., "Characterization of an 'orthogonal' Suppressor tRNA Derived from <i>E. coli</i> tRNA ₂ ^{Gln} ," <i>Chem Biol.</i> , 4(9):685-91, September 1997.
EF	Lorincz, M., et al., "Enzyme-generated Intracellular Fluorescence for Single-cell Reporter Gene Analysis Utilizing <i>Escherichia Coli</i> Beta-glucuronidase," <i>Cytometry</i> , 24(4):321-9, August 1, 1996.
EG	Lu, T., et al., "Probing Ion Permeation and Gating in a K ⁺ Channel with Backbone Mutations in the Selectivity Filter," <i>Nat Neurosci.</i> , 4(3):239-46, March 2001.
EH	Ma, C., et al., "In Vitro Protein Engineering Using Synthetic tRNA ^{Ala} with Different Anticodons," <i>Biochemistry</i> , 32(31):7939-45, August 10, 1993.
EI	Matsoukas, J., et al., "Differences in Backbone Structure Between Angiotensin II Agonists and Type I Antagonists," <i>J Med Chem.</i> , 38(23):4660-9, November 10, 1995.
EJ	McMinn, D., et al., "Efforts Toward Expansion of the Genetic Alphabet: DNA Polymerase Recognition of a Highly Stable, Self-Pairing Hydrophobic Base," <i>J. Am. Chem. Soc.</i> , 121:11585-11586, 1999.
EK	Meggers, E., et al., "A Novel Copper-Mediated DNA Base Pair," <i>J. Am. Chem. Soc.</i> , 122:10714-15, 2000.
EL	Mendel, D., et al., "Site-directed Mutagenesis with an Expanded Genetic Code," <i>Annu Rev Biophys Biomol Struct.</i> , 24:435-62, 1995.

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FB					

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

FC	Miller, J., et al., "Flash Decaging of Tyrosine Sidechains in an Ion Channel," <i>Neuron</i> , 20(4):619-24, April 1998.
FD	Minks, C., et al., "Noninvasive Tracing of Recombinant Proteins with "Fluorophenylalanine-fingers," <i>Anal Biochem.</i> , 284(1):29-34, August 15, 2000.
FE	Moore, B., et al., "Quadruplet Codons: Implications for Code Expansion and the Specification of Translation Step Size," <i>J Mol Biol.</i> , 298(2):195-209, April 28, 2000.
FF	Nickitenko, A., et al., 2 Å Resolution Structure of DppA, a Periplasmic Dipeptide Transport/Chemosensory Receptor," <i>Biochemistry</i> , 34(51):16585-95, December 26, 1995.
FG	Nilsson, B., et al., "A Synthetic IgG-binding Domain Based on Staphylococcal Protein A," <i>Protein Eng.</i> , 1(2):107-13, Feb-Mar 1987.
FH	O'Mahony, D., et al., "Glycine tRNA Mutants with Normal Anticodon Loop Size Cause -1 Frameshifting," <i>Proc Natl Acad Sci U S A.</i> , 86(20):7979-83, October 1989.
FI	Ogawa, A., et al., "Efforts Toward the Expansion of the Genetic Alphabet: Information Storage and Replication with Unnatural Hydrophobic Base Pairs," <i>J. Am. Chem. Soc.</i> 122:3274-3287, 2000.
FJ	Ogawa, A., et al., "Rational Design of an Unnatural Base Pair with Increased Kinetic Selectivity," <i>J. Am. Chem. Soc.</i> , 122:8803-8804, 2000
FK	Ohno, S., et al., "Co-expression of Yeast Amber Suppressor tRNA ^{Tyr} and Tyrosyl-tRNA Synthetase in Escherichia coli: Possibility to Expand the Genetic Code," <i>J Biochem (Tokyo)</i> . 124(6):1065-8, December 1, 1998.
FL	Pastmak, M., et al., "A New Orthogonal Suppressor tRNA/aminoacyl-tRNA Synthetase Pair for Evolving an Organism with an Expanded Genetic Code," <i>Helv. Chim. Acta</i> , 83:2277-2286, 2000.
FM	Pastmak, M., et al., "Phage Selection for Site-specific Incorporation of Unnatural Amino Acids into Proteins In Vivo," <i>Bioorg Med Chem.</i> , 9(9):2373-9, 2001.

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	GB					

OTHER PRIOR ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	GC	Saks, M., et al., "An Engineered Tetrahymena tRNA ^{Gln} for in Vivo Incorporation of Unnatural Amino Acids into Proteins by Nonsense Suppression," <i>J Biol Chem.</i> , 271(38):23169-75, September 20, 1996.
	GD	Santoro, S., et al., "An Efficient System for the Evolution of Aminoacyl-tRNA Synthetase Specificity," <i>Nat. Biotechnol.</i> , 20(10):1044-8, October 20, 2000.
	GE	Sayers, J., et al., "5'-3' Exonucleases in Phosphorothioate-based Oligonucleotide-directed Mutagenesis," <i>Nucleic Acids Res.</i> , 16(3):791-802, February 11, 1988.
	GF	Shao, J., et al., "Unprotected Peptides as Building Blocks for the Synthesis of Peptide Dendrimers with Oxime, Hydrazone, and Thiazolidine Linkages," <i>J. Am. Chem. Soc.</i> , 117(14):3893-3899, 1995.
	GG	Sharma, N., et al., "Efficient Introduction of Aryl Bromide Functionality into Proteins in Vivo," <i>FEBS Lett.</i> , 467(1):37-40, February 4, 2000.
	GH	Sieber, V., et al., "Libraries of Hybrid Proteins from Distantly Related Sequences," <i>Nat Biotechnol.</i> , 19(5):456-60, May 2001.
	GI	Sprinzi, M., et al., "Compilation of tRNA Sequences and Sequences of tRNA Genes," <i>Nucleic Acids Res.</i> , 26(1):148-53, January 1, 1998.
	GJ	Steer, B., et al., "Major Anticodon-binding Region Missing from an Archaeobacterial tRNA Synthetase," <i>J Biol Chem.</i> , 274(50):35601-6, December 10, 1999.
	GK	Subasinghe, N., et al., "Quisqualic Acid Analogues: Synthesis of β -heterocyclic 2-aminopropanoic Acid Derivatives and their Activity at a Novel Quisqualate-sensitized Site," <i>J Med Chem.</i> , 35(24):4602-7, November 27, 1992.
	GL	Sussman, J., et al., "Crystal Structure of Yeast Phenylalanine Transfer RNA. I. Crystallographic Refinement," <i>J Mol Biol.</i> , 123(4):607-30, August 5, 1978.
	GM	Switzer, C., et al., "Enzymatic Incorporation of a New Base Pair into DNA and RNA,," <i>J. Am. Chem. Soc.</i> , 111:8322-8323, 1989.

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HC	Tae, E., et al., "Efforts Toward Expansion of the Genetic Alphabet: Replication of DNA with Three Base Pairs," <i>J Am Chem Soc.</i> , 123(30):7439-40, August 1, 2001.
HD	Tang, Y., et al., "Fluorinated Coiled-Coil Proteins Prepared In Vivo Display Enhanced Thermal and Chemical Stability," <i>Angew Chem Int Ed Engl.</i> , 40(8):1494-1496, April 17, 2001.
HE	Turcatti, G., et al., "Probing the Structure and Function of the Tachykinin Neurokinin-2 Receptor through Biosynthetic Incorporation of Fluorescent Amino Acids at Specific Sites," <i>J Biol Chem.</i> , 271(33):19991-8, August 16, 1996.
HF	Van Hest, J., et al., "Efficient Incorporation of Unsaturated Methionine Analogues into Proteins in Vivo," <i>J. Am. Chem. Soc.</i> , 122:1282-1288, 2000.
HG	Van Hest, J., et al., "Efficient Introduction of Alkene Functionality into Proteins in vivo," <i>FEBS Lett.</i> , 428(1-2):68-70, May 22, 1998.
HH	Wakasugi, K., et al., "Genetic Code in Evolution: Switching Species-specific Aminoacylation with a Peptide Transplant," <i>EMBO J.</i> , 17(1):297-305, January 2, 1998.
HI	Wang, L., et al., "A New Functional Suppressor tRNA/aminoacyl-tRNA Synthetase Pair for the in Vivo Incorporation of Unnatural Amino Acids into Proteins," <i>J. Am. Chem. Soc.</i> , 122:5010-5011, 2000.
HJ	Wang, L., et al., "A General Approach for the Generation of Orthogonal tRNAs," <i>Chem Biol.</i> , 8(9):883-90, September 2001.
HK	Wang, L., et al., "Expanding the Genetic code of Escherichia coli," <i>Science</i> , 292(5516):498-500, April 20, 2001.
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EXAMINER	DATE CONSIDERED
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* EXAMINER: Initial if reference considered, whether or not criteria is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant(s).